



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : A22B 3/00, 3/08, A22C 21/00	A1	(11) International Publication Number: <b>WO 94/15469</b> (43) International Publication Date: 21 July 1994 (21.07.94)
--	----	---

(21) International Application Number: PCT/NL93/00284

(22) International Filing Date: 30 December 1993 (30.12.93)

(30) Priority Data:

9202289	30 December 1992 (30.12.92)	NL
9300254	9 February 1993 (09.02.93)	NL

(71) Applicant (for all designated States except US): STORK PMT B.V. [NL/NL]; Handelstraat 3, NL-5831 AV Boxtmeer (NL).

(72) Inventors; and

(75) Inventors/Applicants (for US only): LANKHAAR, Jenneke, Antonia, Christina [NL/NL]; Hennen Weide 2, NL-5221 BR Bokhoven (NL). VAN DEN NIEUWELAAR, Adrianus, Josephes [NL/NL]; Den Hoek 33, NL-5421 XG Gemert (NL).

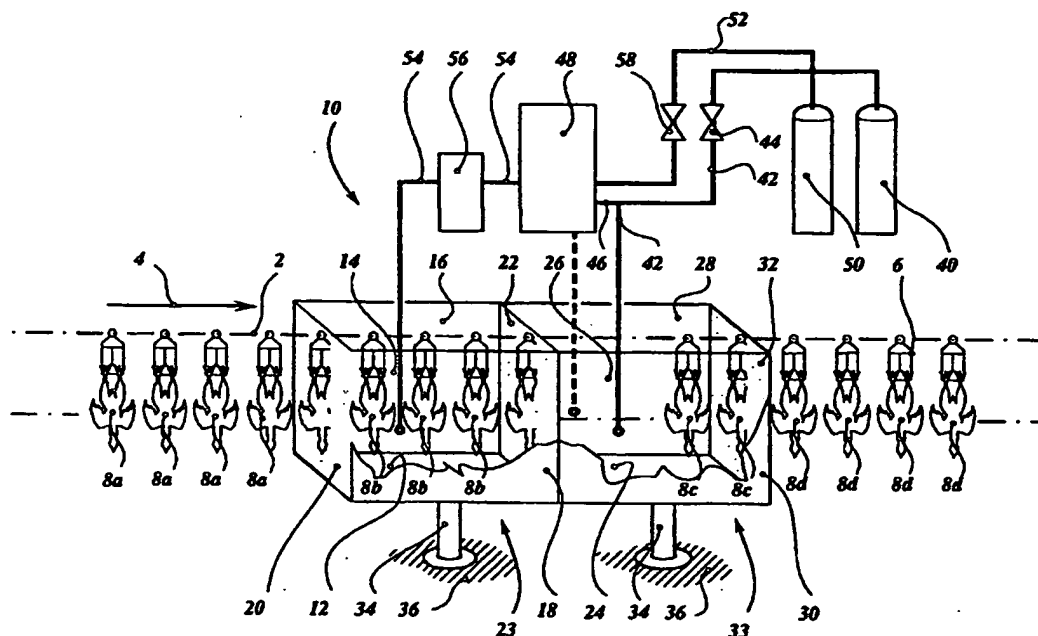
(74) Agent: MERTENS, H., V.; Exterpatent B.V., P.O. Box 3241, NL-2280 GE Rijswijk (NL).

(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published

With international search report.  
In English translation (filed in Dutch).

(54) Title: METHOD AND DEVICE FOR STUNNING OF POULTRY



(57) Abstract

Method and device for stunning poultry (8a, 8b, 8c, 8d), which poultry are taken into a first chamber (23) by means of a conveyor (2, 6), which chamber contains a first stunning gas or gas mixture which is mixed with oxygen, and are subsequently taken into a second chamber (33) which is essentially separated from the first chamber as regards gas and which contains a second stunning gas or gas mixture for increasing the stunning achieved in the first chamber.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LV	Latvia	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	MC	Monaco	TG	Togo
CZ	Czech Republic	MD	Republic of Moldova	TJ	Tajikistan
DE	Germany	MG	Madagascar	TT	Trinidad and Tobago
DK	Denmark	ML	Mali	UA	Ukraine
ES	Spain	MN	Mongolia	US	United States of America
FI	Finland			UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

Method and device for stunning of poultry.

The invention relates to a method and device for stunning poultry by means of a gas or gas mixture which, at the concentration in which it is present, has the effect of stunning the poultry .

5           From FR-A-2 334 296 a method and device are known for putting down small mammals, such as cats, puppies, mice, rats and the like. The method comprises placing the mammal to be killed in a first chamber which is open at the top and filled with a gas mixture of oxygen and carbon  
10 dioxide for a time which is sufficient to stun the animal. Subsequently, the animal is placed in a second chamber which is open at the top and filled with a high concentration of carbon dioxide for a time which is sufficient to end the life of the animal.

15           If poultry are to be stunned by means of a gas, one is not inclined to apply methods known for mammals, because of the fact that the respiratory system of poultry is structured differently from that of mammals and is connected to a number of air sacs which are located in the  
20 body of poultry and serve to provide buoyancy and body balance control. Said air sacs, which may either be filled with a considerable amount of air or may be empty, are the reason why stunning poultry by means of gas according to the state of the art sometimes takes a relatively long time  
25 and in some cases is effected relatively quickly. The resulting unreliability in stunning poultry by means of gas can, of course, be eliminated by continuing the stunning for such a long time that even poultry with a great deal of air in the air sacs can be guaranteed to have been stunned.  
30 However, the concomitant shortness of breath and fear reactions are accompanied by severe convulsions. Not only is this a very unpleasant situation for the poultry, but in general this also leads to contusions, fractures or the like, while the quality of the meat of the poultry is  
35 adversely affected by the concomitant biochemical immune responses in their body. Incidentally, electrocution, which is traditionally used for stunning poultry, has the same disadvantages.

Moreover, if such a method were to be used on an industrial scale for stunning poultry prior to their slaughter, a vast installation would be required to achieve the long residence time necessary for the poultry in a gas-filled chamber in view of the large numbers of poultry to be processed.

Surprisingly, it was found, however, that the method described above and known for mammals results in quick and reliable stunning when applied to poultry, without discomfort for the poultry, and thus without convulsions.

The object of the invention is thus to provide a method with a high processing rate for stunning poultry, in which method according to the invention the poultry are taken into a chamber by means of mechanical conveying means, which chamber contains a first stunning gas or gas mixture which is mixed with oxygen, and are subsequently taken into a chamber which contains a second stunning gas or gas mixture. It may be just one chamber which contains the first and the second stunning gas or gas mixture and the oxygen in the indicated order, but preferably the first stunning gas or gas mixture which is mixed with oxygen is in a first chamber, and the second stunning gas or gas mixture is in a second chamber which is essentially separated from the first chamber as regards gas. Because in the chamber or first chamber a stunning gas or gas mixture in combination with oxygen is present, the poultry can be stunned quickly and virtually without noticing it, if desired in such a way that results in unconsciousness, in which case the tranquillizing action of the gas or gas mixture prevents the occurrence of undesirable uncontrolled muscle movements, for example caused by anxiety or an unpleasant smell. As soon as the desired stunning in the chamber or first chamber is achieved, the stunning of the poultry can be increased in such a manner (by introducing the second stunning gas or gas mixture into the chamber or by transferring the poultry to the second chamber) that the poultry do not regain full consciousness prior to the slaughtering process. The poultry will be killed if they

reside in the second gas or gas mixture for a sufficiently long period of time and the oxygen concentration is sufficiently low. Therefore, time is an important factor in determining the condition of the poultry after the stunning treatment. The residence time of the poultry in the chambers may be predetermined, based on empirical values, but it is also possible to choose the residence time as a function of a measurement of the concentration of the gas mixture in the chambers, or of a measurement of the poultry present in the chamber, for example a measurement of their heart rate. In order further to increase the efficiency of the stunning process, more than two chambers may be provided, optionally containing other stunning gases or gas mixtures, in different concentrations. It has been found that the method according to the invention yields meat of a better quality than the conventional method using electrocution. Especially the colour of the meat and the liver are improved and there is no extravasation.

Good stunning results are obtained if the oxygen concentration in the chamber or first chamber is at least 15 % by vol. Preferably, the stunning gas in this case comprises carbon dioxide in a concentration of at least 25 % by vol., but nitrous oxide, ether, cyclopropane or halothane can also be used advantageously as the stunning gas.

Particularly good stunning results are obtained if the first chamber contains a gas mixture of approximately 60 % by vol. of carbon dioxide and at least approximately 30 % by vol. of oxygen. It appears that when using such a gas mixture, poultry already become unconscious within between half a minute and several minutes, depending on their body weight, while virtually no discomfort for the poultry can be detected within that period of time.

In order to achieve as low as possible a gas consumption in the combination consisting of the first and second chamber, a portion of the gas or gas mixture is removed from the second chamber and mixed with oxygen in order to prepare the gas mixture for the first chamber.

An undesirable, unpleasant stimulation of the

mucous membranes of the poultry when breathing in the gas contained in the chamber or chambers is prevented by humidifying the gas or gas mixture to be fed into the chamber or chambers, for example by passing the gas through  
5 a trough of water, by spraying water droplets into the gas or gas mixture, or by injecting it with steam. Preferably, the water with which the gas or gas mixture is brought into contact has a temperature of at least 25°C.

When stunning poultry prior to slaughtering in a  
10 conventional manner by means of an electric current, the poultry are usually stunned one at a time for practical reasons. Although this method can, of course, be maintained with the method according to the invention, the latter offers the advantageous possibility of simultaneously  
15 taking a number of poultry in a box or container into the chamber or chambers, which can appreciably increase the processing rate of the stunning process.

The invention furthermore relates to a device for implementing the method described above, comprising a first  
20 chamber and a second chamber having one or more openings through which the poultry can be taken into the first or second chamber, respectively, and be removed therefrom, the first chamber being provided with means for feeding in a first stunning gas or gas mixture which is mixed with  
25 oxygen, and the second chamber being provided with means for feeding in a second stunning gas or gas mixture, mechanical conveying means being provided for taking the poultry into the first and second chamber.

Preferably, provision is made for sealing means,  
30 for generally sealing the openings of at least the second chamber in a passable manner, as the concentration of the stunning gas or gas mixture is generally higher in the second chamber and escape of this gas is to be prevented as far as possible. Preferably, however, provision is also  
35 made for sealing means for generally sealing the openings of the first chamber.

In order to achieve a compact construction of the device, the outlet opening of the first chamber coincides with the inlet opening of the second chamber.

An adequate closing off of an opening of the first or second chamber is obtained by means of a strip curtain or air curtain, which prevents gas from leaking out of the first and second chamber, on the one hand, and can easily  
5 be passed through by the poultry, on the other hand.

In a preferred embodiment, the mechanical conveying means comprise a conveyor whose track extends in the first and second chamber. As the stunning gas or gas mixture generally has a higher density than air and  
10 therefore tends to accumulate at the bottom of the second chamber, escapes of gas from the second chamber can be reduced if the track of the conveyor in the second chamber descends from the inlet opening and ascends to the outlet opening. In order to achieve a good adjustment of the  
15 stunning process according to the invention to a subsequent section of a slaughtering line, in which the poultry are usually moved along by a conveyor at a constant speed, the conveyor used in the stunning process can be driven continuously at a certain speed, the dimensions of the  
20 first chamber in the conveying direction being such that the desired stunning of the poultry occurs in the first chamber at the given speed. However, at conventional poultry-conveying speeds, the dimensions of the first chamber will generally have to be considerable, which can  
25 sometimes be inconvenient. In such cases, a different embodiment is provided, in which the conveyor is driven intermittently and the poultry are in the first and second chamber, respectively, for two successive stationary periods of the conveyor. In this embodiment, the dimensions  
30 of the first and second chamber can be very small, viewed in the conveying direction.

In a preferred embodiment, the conveying means are equipped for conveying a box or a container holding poultry.

35 The device according to the invention can be incorporated into an existing slaughtering line, while it is also possible, moreover, to replace a conventional stunning apparatus incorporated into an existing slaughtering line with a device according to the invention.

In both cases, only first and second chambers and gas feeding means will need to be installed in and along the track of a conveyor which is already present.

The invention is explained with reference to the  
5 drawing, in which:

Fig. 1 shows a diagrammatic, partly cut-away view of a first embodiment of a stunning device for birds according to the invention; and

Figs. 2a-2c show a diagrammatic, partly cut-away  
10 view of parts of a second embodiment of a stunning device for birds according to the invention.

In the figures, identical parts or parts having similar functions are referred to by identical reference numerals.

15 Fig. 1 shows a conveying rail, conveying chain 2 or the like, which is provided with hooks 6 from which birds 8a, 8b, 8c and 8d are suspended by their legs and which can be carried along in the direction of the arrow 4. In the path of the birds 8a, 8b, 8c and 8d a stunning device 10 is  
20 placed having a first chamber 23 bounded by walls 12, 14, 16, 18, 20 and 22, and a second chamber 33 bounded by walls 24, 26, 28, 30, 22 and 32. The first chamber 23 and the second chamber 33 are secured on a base 36 through supports 34. The configuration of the walls 20, 22 and 32 is such  
25 that a bird can pass through these walls, but that they are essentially sealed as regards gas when no bird is present. For this purpose, the walls 20, 22 and 32 are formed, for example, by a strip curtain, an air curtain, a water curtain or a moving screen. The remaining walls 12, 14, 16,  
30 18 of the first chamber 23 and the walls 24, 26, 28, 30 of the second chamber 33 are essentially permanently closed and consist, for example, of steel-plate panels.

A supply tank 40 is filled with a pressurized stunning gas or gas mixture and is connected to the second  
35 chamber 33 via a pipe 42 which incorporates a shut-off valve 44. Furthermore, the supply tank 40 is connected to a mixing chamber 48 via a pipe 46. A supply tank 50 for pressurized oxygen is connected to the mixing chamber 48 via a pipe 52 which incorporates a shut-off valve 58. The



mixing chamber 48 is connected to the first chamber 23 via a pipe 54 which incorporates a humidifier 56. For the purpose of recirculating gas, it is also possible to fit a pipe 60 which forms a connection between the second chamber 33 and the mixing chamber 48, instead of pipe 46 between supply tank 40 and mixing chamber 48. The pipe 60 is indicated by a dashed line in Fig. 1.

The device according to Fig. 1 operates as follows. By opening the shut-off valves 44 and 58, a mixture of the gases originating from supply tanks 40 and 50 is introduced into the first chamber 23. In this case, the shut-off valves 44 and 58 are adjusted in such a way that a predetermined concentration of the gases in the first chamber 23 is achieved. In addition, the shut-off valve 44 is set for feeding such an amount of gas originating from the supply tank 40 into the second chamber 33 that a predetermined concentration of the gas is achieved in the second chamber. Subsequently, the conveyor 2, 6 is activated, by means of which live birds 8a are taken into the first chamber 23. When they have arrived in the first chamber 23, the birds 8b are subjected to the stunning and tranquillizing action of the gas mixture originating from the supply tanks 40 and 50. Then the birds are taken into the second chamber 33 by passing through the wall 22. Upon arrival, the degree of stunning of the birds 8c achieved in the first chamber 23 is further increased by the stunning gas present in the second chamber 33, in which case the residence time in the second chamber 33 can be chosen to be long enough for the birds 8c to leave this chamber via the wall 32 stunned, unconscious or dead. The stunned, unconscious or dead birds 8d are then subjected to a conventional slaughtering process. Conveying the birds through the first chamber 23 and the second chamber 33 can be effected either at a constant or variable conveying speed or intermittently.

Fig. 2a illustrates a stunning device 10 which generally corresponds to that according to Fig. 1. A conveyor belt 70 runs through the first chamber 23 and the second chamber 33 and can take a container 72 filled with

live birds in the direction of the arrow 74 at a predetermined, optionally varying, speed successively through the wall 20 into the first chamber 23, through the wall 22 from the first chamber 23 to the second chamber 33, and away  
5 from the second chamber 33 through the wall 32. If the birds in the container 72 are in the first chamber 23, they can be subjected to the stunning and tranquillizing action of the gas mixture originating from the supply tanks 40 and 50; in the second chamber 33 they may also be subjected to  
10 the stunning action of the gas or gas mixture originating from supply tank 40.

Fig. 2b illustrates the bird processing stage which follows the stunning effected in accordance with Fig. 2a. The container 72 is emptied over a conveyor belt 78 moving  
15 in the direction of the arrow 76, as a result of which the stunned, unconscious or dead birds 8 will be carried along. People alongside the track of the conveyor belt 78 can take the birds 8 off the conveyor belt 78 and hang them on hooks 6 of a conveyor moving in the direction of the arrow 4, as  
20 is shown in Fig. 2c. Subsequently, the birds can be subjected to the conventional slaughtering processes, such as exsanguinating, plucking, eviscerating, portioning, boning and the like.

## CLAIMS

1. Method for stunning poultry, (8a, 8b, 8c, 8d), which poultry are taken into a chamber by means of mechanical conveying means (2, 6; 70), which chamber contains a first stunning gas or gas mixture which is mixed with oxygen, and  
5 are subsequently taken into a chamber which contains a second stunning gas or gas mixture.
2. Method according to claim 1, characterized in that the first stunning gas or gas mixture which is mixed with oxygen is in a first chamber (23), and the second gas or  
10 gas mixture is in a second chamber (33) which is essentially separated from the first chamber as regards gas.
3. Method according to claim 1 or 2, characterized in that the oxygen concentration is at least 15 % by vol.
4. Method according to claim 3, characterized in that the  
15 stunning gas comprises carbon dioxide in a concentration of at least 25 % by vol.
5. Method according to claim 3, characterized in that the stunning gas comprises nitrous oxide, ether, cyclopropane or halothane.
- 20 6. Method according to any of claims 1-5, characterized in that the chamber or first chamber (23) contains a gas mixture of approximately 60 % by vol. of carbon dioxide and at least approximately 30 % by vol. of oxygen.
7. Method according to any of claims 2-6, characterized  
25 in that a portion of the gas or gas mixture is removed from the second chamber (33) and mixed with oxygen in order to prepare the gas mixture for the first chamber (23).
8. Method according to any of claims 1-7, characterized in that the gas or gas mixture to be fed into the chamber  
30 or chambers is humidified.
9. Method according to claim 8, characterized in that the gas or gas mixture is brought into contact with water having a temperature of at least 25°C.
10. Method according to any of claims 1-8, characterized  
35 in that a number of poultry can simultaneously be taken in a box or container (72) into the chamber or chambers.
11. Device for carrying out the method according to any of

- the preceding claims, comprising a first chamber (23) and a second chamber (33) having one or more openings through which the poultry (8a, 8b, 8c, 8d) can be taken into the first and second chamber, respectively, and be removed
- 5 therefrom, the first chamber (23) being provided with means (10) for feeding in a first stunning gas or gas mixture which is mixed with oxygen, and the second chamber being provided with means (10) for feeding in a second stunning gas or gas mixture, mechanical conveying means (2, 6; 70)
- 10 being provided for taking the poultry into the first and second chamber.
12. Device according to claim 11, characterized in that provision is made for sealing means, for generally sealing the openings of at least the second chamber (33) in a
- 15 passable manner.
13. Device according to claim 11 or 12, characterized by sealing means for generally sealing the openings of the first chamber (23).
14. Device according to any of claims 11-13, characterized
- 20 in that the outlet opening of the first chamber (23) coincides with the inlet opening of the second chamber (33).
15. Device according to any of claims 11-14, characterized in that one or more of the openings are sealed by a strip
- 25 curtain or an air curtain.
16. Device according to claim 11 or 12, characterized in that the mechanical conveying means comprise a conveyor (2, 6; 70) whose track extends in the first (23) and second (33) chamber.
- 30 17. Device according to claim 15, characterized in that the track of the conveyor in the second chamber (33) descends from the inlet opening and ascends to the outlet opening.
18. Device according to claim 16 or 17, characterized in
- 35 that the conveyor is driven continuously at a certain speed, the dimensions of the first chamber in the conveying direction being such that the desired stunning of the poultry occurs in the first chamber at the given speed.
19. Device according to claim 16 or 17, characterized in

that the conveyor is driven intermittently and the poultry are in the first and second chamber, respectively, for two successive stationary periods of the conveyor.

20. Device according to any of claims 11-19, characterized  
5 in that the conveying means are adapted for conveying a box or a container (72) holding poultry.

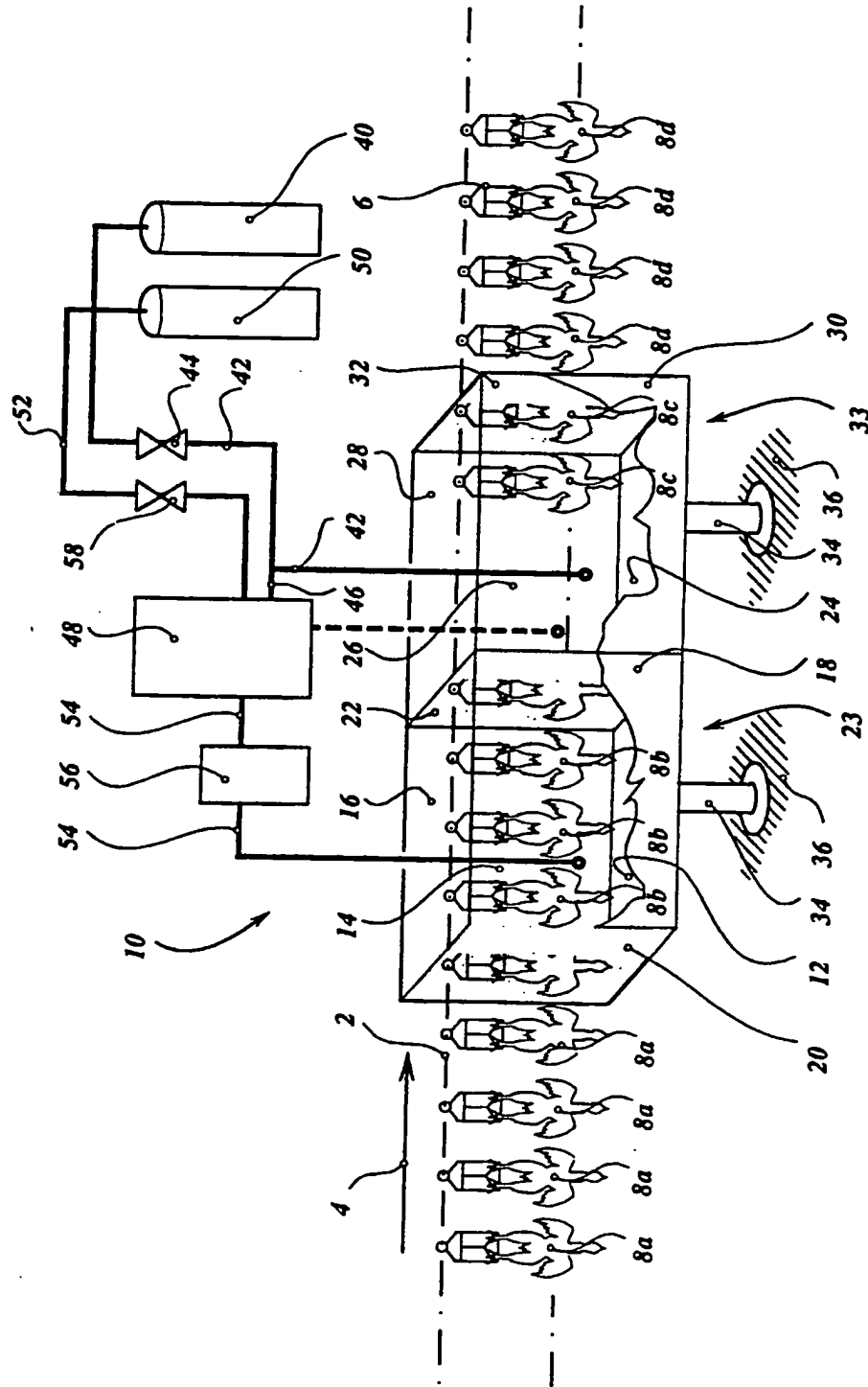
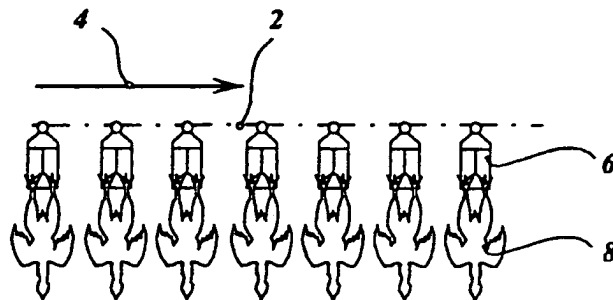
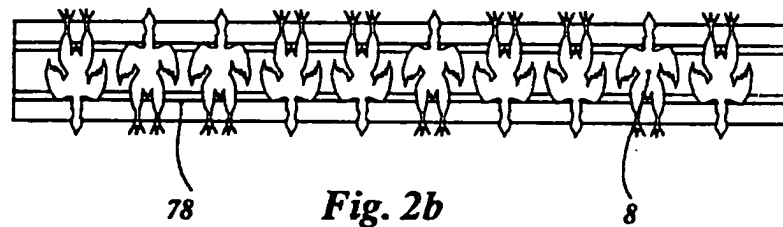
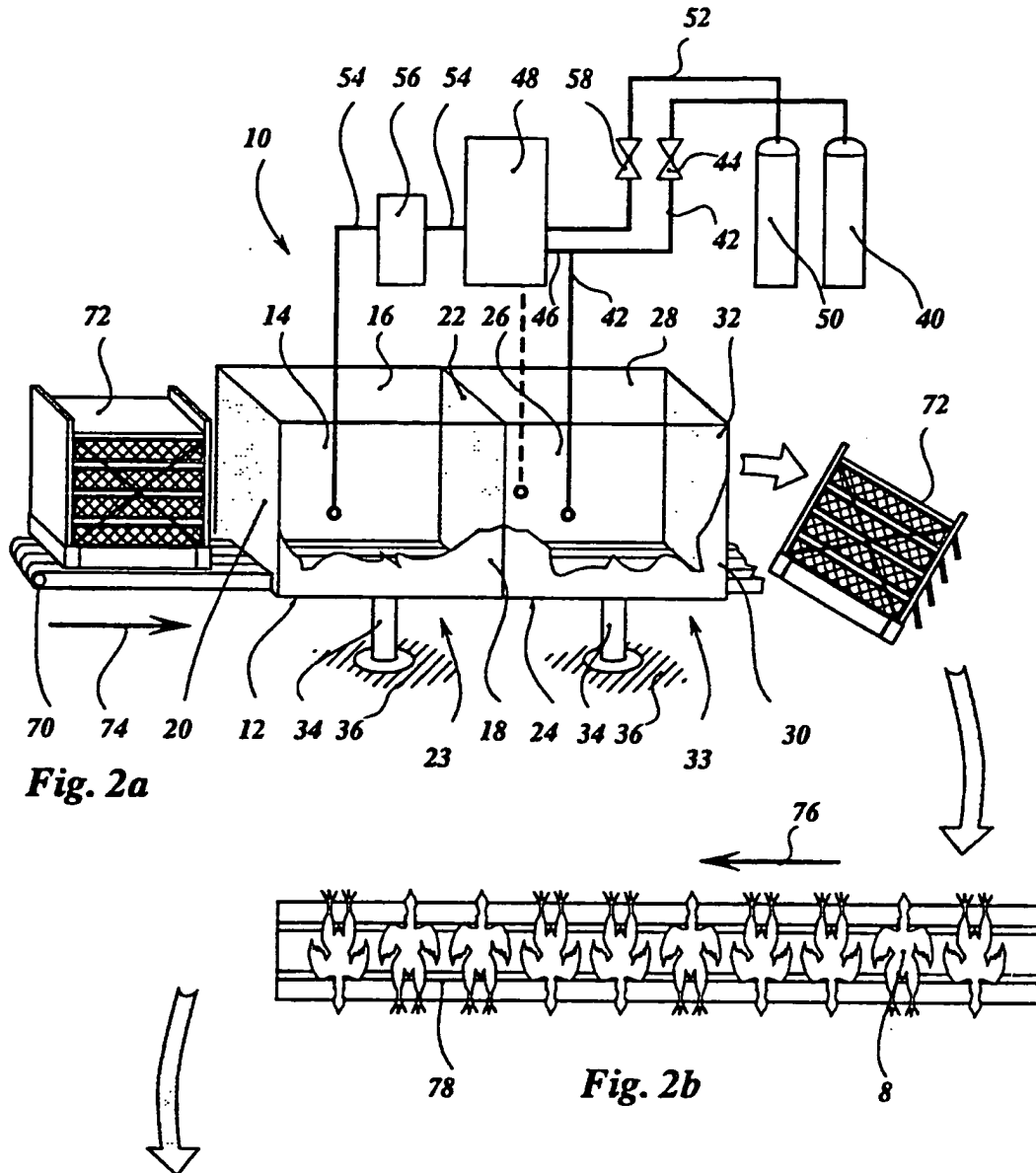


Fig. 1



## INTERNATIONAL SEARCH REPORT

Inte. nal Application No

PCT/NL 93/00284

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 5 A22B3/00 A22B3/08 A22C21/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 A22B A22C A61D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 434 279 (THE BOC GROUP PLC) 26 June 1991 see page 1, line 1 - page 6, line 33 ----	1-11
Y	FR,A,2 334 296 (UNIVERSITIES FEDERATION FOR ANIMAL WELFARE) 8 July 1977 cited in the application see the whole document ----	1-11
A	FR,A,2 534 469 (FONTENEAU) 20 April 1984 ----	
A	EP,A,0 434 278 (THE BOC GROUP PLC) 26 June 1991 -----	

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \* "A" document defining the general state of the art which is not considered to be of particular relevance
- \* "E" earlier document but published on or after the international filing date
- \* "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \* "O" document referring to an oral disclosure, use, exhibition or other means
- \* "P" document published prior to the international filing date but later than the priority date claimed

\* "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\* "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\* "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\* "&" document member of the same patent family

Date of the actual completion of the international search

5 April 1994

Date of mailing of the international search report

26. 04 94

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

von Arx, V



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 93/00284

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0434279	26-06-91	AU-B- 642934	04-11-93
		AU-A- 6790390	27-06-91
		CN-A- 1052592	03-07-91
		US-A- 5152714	06-10-92
FR-A-2334296	08-07-77	GB-A- 1521700	16-08-78
		AU-B- 500242	17-05-79
		AU-A- 2039476	15-06-78
		CA-A- 1069433	08-01-80
		DE-A- 2656171	23-06-77
		US-A- 4107818	22-08-78
FR-A-2534469	20-04-84	NONE	
EP-A-0434278	26-06-91	AU-B- 642935	04-11-93
		AU-A- 6790490	27-06-91
		CN-A- 1052593	03-07-91

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**